



Smart Grid Distributed Energy Storage Demonstration

Presented to:

ENERGY STORAGE SYSTEMS PROGRAM ESS Peer Review - 2011

Presented by:

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Project Objectives



- **Demonstrate** competitively-priced, multi-megawatt, long-duration advanced batteries for utility grid applications.
- **Improve** load management, including peak shaving and time shifting from low - to high - value periods
- **Develop** and verify creative control algorithms to manage storage systems used in micro-grid applications and fleet operations
- **Validate** the economic benefits of stored energy into multiple Independent System Operator/Control Areas with distinct pricing
- **Share** the lessons learned from these demonstrations with the wider community
- **Increase** the acceptance of renewable energy systems by eliminating the effects of intermittency
- **Generate** jobs in the states where materials and supporting systems are assembled

Team Members



Premium Power Corporation is the prime recipient, and will provide project management, engineering, manufacturing and assembly of the energy storage units.

National Grid will be responsible for the deployment, operation, and monitoring of the ESS Fleet in Everett and Worcester, MA.

SMUD will be responsible for the deployment, operation and monitoring of the ESS Fleet in the Sacramento, CA.

SAIC will provide project assistance to all project partners, cyber security and engineering support, data collection and cost/benefit analysis

Worcester Polytechnic Institute will support the two demonstration sites of National Grid, and provide assistance in modeling, simulation, data analysis, curriculum development, and outreach

NREL, already involved with SMUD's PV projects, will provide distribution system monitoring and data analysis on storage and PV impacts to the distribution system

Project Overview



Install 5 TransFlow 2000 500kW Energy Storage Devices at locations within the National Grid and SMUD Utility Districts as follows:

- **2 units at the National Grid Thorndike Substation Everett, MA**
- **1 Unit at the National Grid customer site in Worcester, MA**
- **1 Unit at the SMUD Headquarters Micro-Grid**
- **1 Unit at the SMUD Anatolia SolarSmart Homes Project**



Technology - TransFlow 2000



- 500 kW Power
- 3.0 MWh Storage
- Modular & Scalable
- Minimal Maintenance
- Environmentally Friendly
- Size: 53'L x 9.5'W x 13.5'H
- Integrated Chiller & PCU
- Fully autonomous – remote operation



Site 1 – National Grid Thorndike Substation – Everett, MA

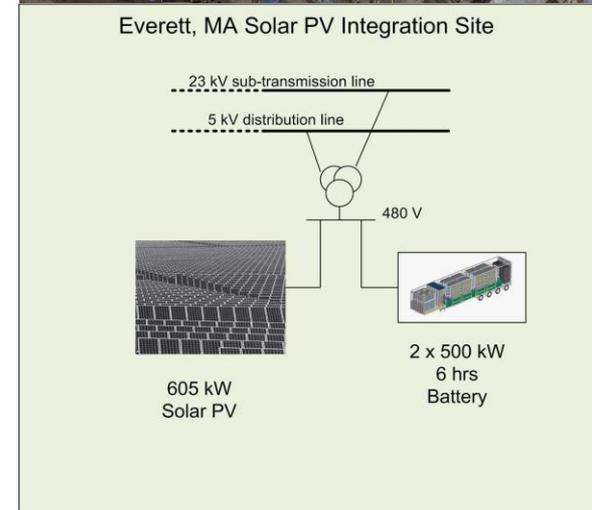


Objective

- Provide PV array capacity firming
- Improve power quality by providing voltage support
- Determine optimal control methods
- Improve transmission capacity
- Defer substation equipment upgrades

Benefit

- Energy efficiency improvement
- Reliability Improvement
- Reduced air emissions
- Reduce capital expenditures



Site 2 – National Grid Wind Turbine Site – Worcester, MA



Objective

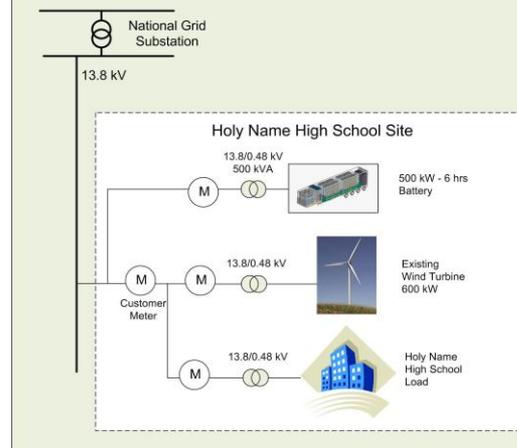
- Capacity firming and time energy shift of wind turbine power
- Improved power quality with voltage support
- Peak shaving and load management for reduced demand charges

Benefit

- Electricity cost savings
- Reduced air emissions
- Reduce capital expenditures



Holy Name High School Storage Demonstration Site – Worcester, MA



Site 3 - SMUD Anatolia SolarSmart Homes

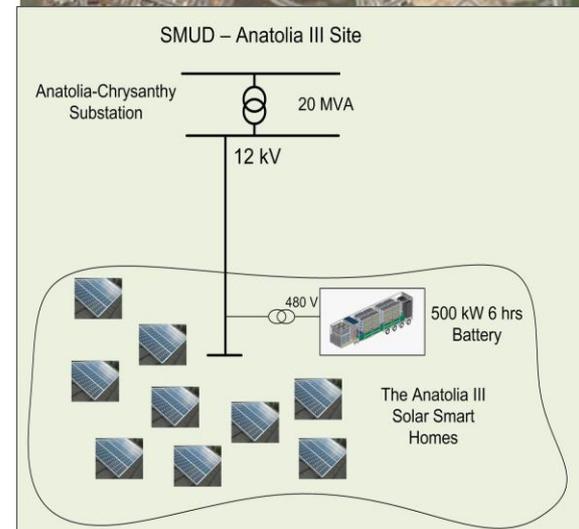


Objective

- Determine value of energy storage on a feeder exporting net PV output
- Evaluate energy storage for home and business load management
- Demonstrate improvements in power quality through voltage support

Benefit

- Energy efficiency improvement
- Renewable energy integration
- Peak load shaving
- Reduced air emissions



Site 4 - SMUD SMUD HQ Microgrid

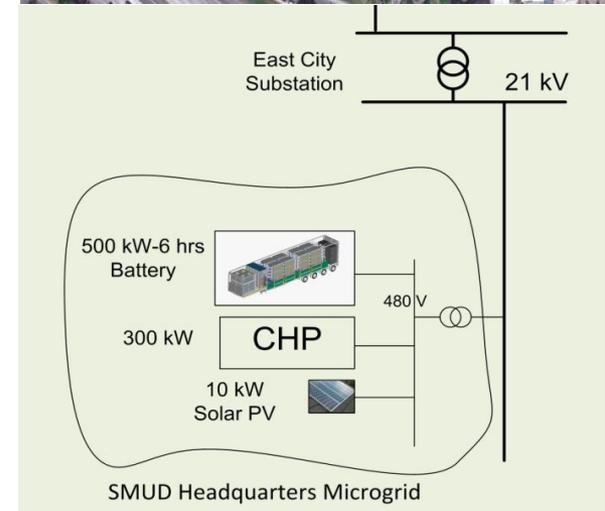


Objective

- Determine value of energy storage in a microgrid
- Evaluate use during emergency operations
- Optimize PV and CHP assets in a microgrid environment
- Peak shaving and load shifting

Benefit

- Improve energy efficiency
- Reduce electricity cost
- Improved microgrid stability and Islanding
- Reduce outage impact



Status to Date



- **Current Phase: II – Final Design & Construction**
- **Recent Deliverables Submitted:**
 - Interoperability and Cyber Security Plan
 - Preliminary Design and Commissioning Plan
- **Demonstration Site and Equipment Status**
 - Re-planned National Grid sites from NY to MA
 - MA Sites surveyed and initial site development plans prepared
 - Commenced production of 5 TF2000s
- **Next Deliverable Milestones:**
 - Quarterly Build Metrics Report – Oct 2011
 - Data Acquisition and Analysis Plan – Dec 2011
 - Final Design and Commissioning Plan – Dec 2011

Future Tasks

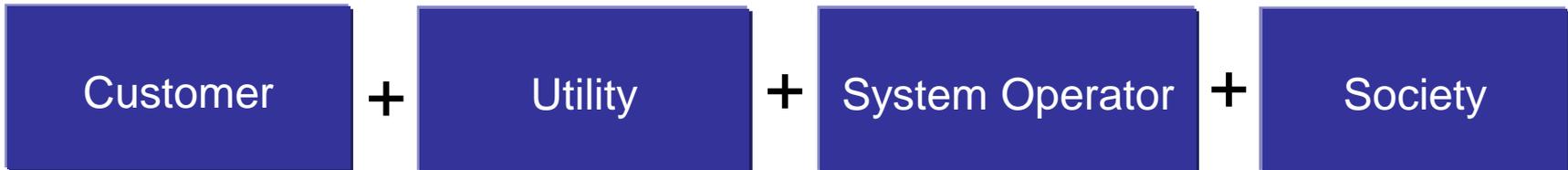


- **Demonstration Site Preparation** **Nov 2011 - Mar 2012**
- **Manufacture and Deliver – All Units** **Mar 2012 – Jul 2012**
- **Install & Integrate – All Units** **Apr 2012 – Aug 2012**
- **Operational Go/No Go – All Units** **May 2012 – Sep 2012**
- **Commissioning & Operation** **Jun 2012 – Oct 2014**
- **Final Project Report** **Oct 2014**
- **Project Closeout** **Oct 2014**

Summary – Benefits to Stakeholders



Energy storage is a cost effective approach providing numerous benefits to many stakeholders



- **Reduced energy ⁽¹⁾ and demand costs**

- Emergency back up

- Demand response

- **Improved reliability**

- Load leveling
- T&D relief / deferral

- **Improved power quality**

- **Reduce peak gen. and spinning reserve needs**

- Ancillary services
- Grid integration
- Improved grid reliability & security

- **More renewables**
- **Fewer emissions**
- Healthier climate
- More jobs

(1) Items in red to be demonstrated



Thank You

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